UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,853,654 B2
APPLICATION NO. : 10/099649
DATED : February 8, 2005
INVENTOR(S) : McDonald et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Col. 23 line 47 through Col. 28 line 45, Delete claims 1-56, and insert the attached set of claims.

1. An apparatus, comprising:

a first tunable wavelength selection element configured to define a first plurality of tunable transmission peaks separated by a first adjustable free spectral range, the first plurality of tunable transmission peaks within a gain bandwidth of a gain medium optically couplable to the optical tuning apparatus;

a second tunable wavelength selection element configured to define a second plurality of tunable transmission peaks separated by a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium; and

a controller, operatively coupled to each of the first and second tunable wavelength selection elements, to adjust the first and second free spectral ranges to produce at least one tunable joint transmission peak, wherein each of said at least one tunable joint transmission peak comprises a respective pair of transmission peaks, one from each of the first and second plurality of tunable transmission peaks, that are aligned, and said at least one tunable transmission peak is tuned using a Vernier tuning effect.

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2. The apparatus of claim 1, wherein said at least one joint transmission peak is adjustable according to tuning of said first and second tunable wavelength selection elements.

3. The apparatus of claim 1, wherein said first and second tunable wavelength selection elements comprise at least one etalon.

4. The apparatus of claim 1, wherein said first and second tunable wavelength selection elements comprise at least one grating.

5. The apparatus of claim 1, wherein said first and second tunable wavelength selection elements comprise first and second etalons.

6. The apparatus of claim 5, wherein at least one of said first and second etalons is a tunable air gap etalon.

7. The apparatus of claim 1, wherein the first and second tunable wavelength selection elements are configured in a birefringent etalon.

8. The apparatus of claim *5,* wherein at least one of said first and second etalons is angle tuned.

9. The apparatus of claim *5,* wherein at least one of said first and second etalons comprises a wedge-shaped etalon that is positioned via a micro-electro-mechanical systems (MEMS) actuator.

10. The apparatus of claim 5, wherein at least one of said first and second etalons includes first and second surfaces, each said surface having at least one quarter wave dielectric pair layer thereon.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

11. The apparatus of claim 1, further comprising a beam splitter positioned in a light beam generated by the gain medium, the beam splitter positioned before the first and second tunable wavelength selection elements, the beam splitter to pass a first_light beam to the first tunable wavelength selection element and to pass a second light beam to the second tunable wavelength selection element.

12. The apparatus of claim 5, wherein said controller comprises a thermal controller, wherein the first and second etalons are thermo-optically tunable.

13. The apparatus of claim 1, wherein a rear facet of the gain medium and a reflector optically couplable to the gain medium define an external laser cavity of the apparatus, wherein the external laser cavity serves as the second tunable wavelength selection element.

14. A laser apparatus, comprising

a base;

a gain medium, operatively coupled to the base, to emit a light beam in response to an electric input;

a first tunable wavelength selection element operatively coupled to the base and positioned in the light beam, configured to define a first plurality of tunable transmission peaks having a first adjustable free spectral range, the first plurality of tunable transmission peaks within a gain bandwidth of the gain medium;

a second tunable wavelength selection element operatively coupled to the base and positioned in the light beam, configured to define a second plurality of tunable

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transmission peaks having a second adjustable free spectral range, the second plurality of tunable transmission peaks within the gain bandwidth of the gain medium; and

a controller, operatively coupled to each of the first and second tunable wavelength selection elements, to tune a wavelength of an optical output produced by the laser apparatus by concurrently adjusting the first and second free spectral ranges of the first and second tunable wavelength selection elements to define a single joint transmission peak within a selectable wavelength range and adjustable in phase according to tuning of said first and second tunable wavelength selection elements.

15. The laser apparatus of claim 14, wherein the gain medium comprises a laser diode having first and second facets defining an internal cavity having a free spectral range and emitting the light beam from the first facet.

16. The laser apparatus of claim 15, further comprising a reflective element positioned in said light beam after the first and second tunable wavelength selection elements, the reflective element and the second facet of the gain medium defining an external cavity.

17. The laser apparatus of claim 15, wherein the first tunable wavelength selection element has a first free spectral range that is approximately equal to a multiple of the free spectral range of the gain medium.

18. The laser apparatus of claim 15, wherein the second tunable wavelength selection element has a second free spectral range that is approximately equal to a multiple of the free spectral range of the gain medium.

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19. The laser apparatus of claim 15, wherein the selectable wavelength range is at least as great as a gain bandwidth of said gain medium.

20. The laser apparatus of claim 14, wherein said first and second tunable wavelength selection elements comprise at least one etalon.

21. The laser apparatus of claim 14, wherein said first and second tunable wavelength selection elements comprise at least one grating.

22. The laser apparatus of claim 14, wherein said first and second tunable wavelength selection elements comprise first and second tunable etalons.

23. The laser apparatus of claim 22, wherein at least one of said first and second tunable etalons is thermo-optically tunable.

24. The laser apparatus of claim 22, wherein at least one of said first and second tunable etalons is electro-optically tunable.

25. The laser apparatus of claim 22, wherein at least one of said first and second tunable etalons is angle tuned.

26. The laser apparatus of claim 22, wherein at least one of said tunable etalons comprises a semiconductor material.

27. The laser apparatus of claim 22, wherein at least one of said tunable etalons includes first and second surfaces, each said surface having at least one quarter wave dielectric pair layer thereon.

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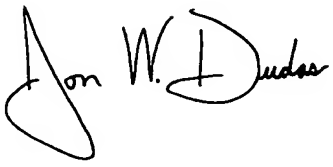
28. The laser apparatus of claim 26, wherein said tunable etalon includes a thermal control element integrated thereon.

29. The laser apparatus of claim 23, wherein said tunable etalon is operatively coupled to a thermal controller.

30. The laser apparatus of claim 23, wherein said tunable etalon is operatively coupled to a thermal reservoir.

Signed and Sealed this

Ninth Day of September, 2008



JON W. DUDAS
Director of the United States Patent and Trademark Office